Draft – Mock-up of possible Images for HIA- Air quality – 2018-08-27

Note: This is a rough doc to help us think through the proposed approach, drafted by Brenda and Margaret, for evaluating possible health impacts of the proposed compressor station. I've added text to answer Brenda's questions.

Numbering and text from Brenda's draft proposed approach doc. are in Times Roman font.

1. Assess existing baseline health and environmental conditions

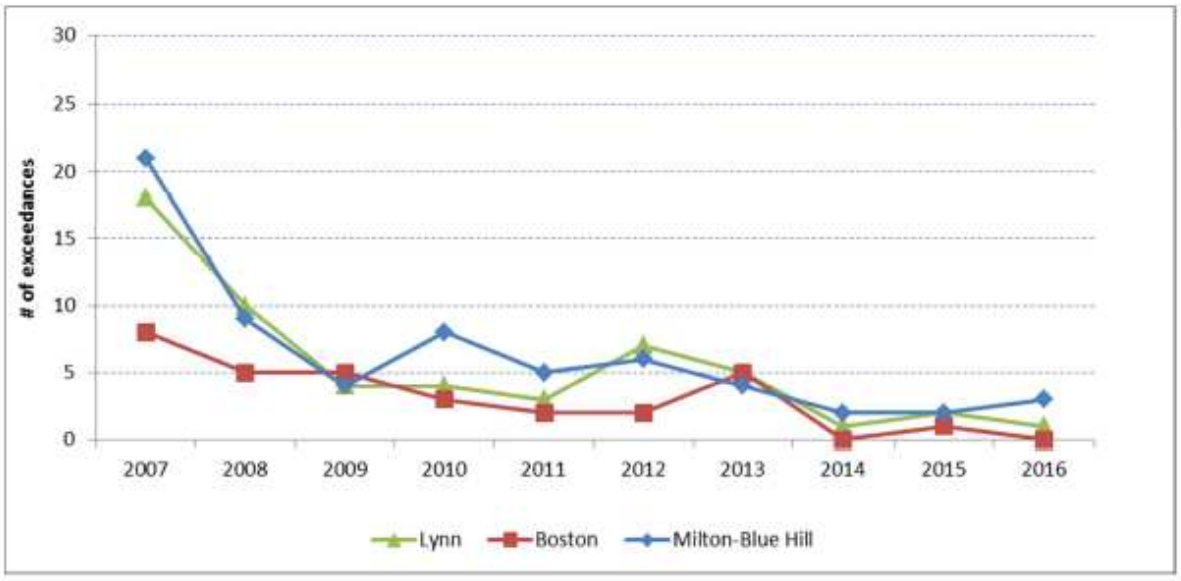
C. Baseline Environmental Conditions (pending discussion with MassDEP)

MassDEP will summarize the available data on outdoor air quality using MassDEP air quality monitoring data for specific criteria pollutants (e.g., ozone, PM2.5, NO2, SO2, CO) and certain air toxics, such as benzene and formaldehyde, and include National Air Toxics Assessment (NATA) data at the census tract level.

NAAQS

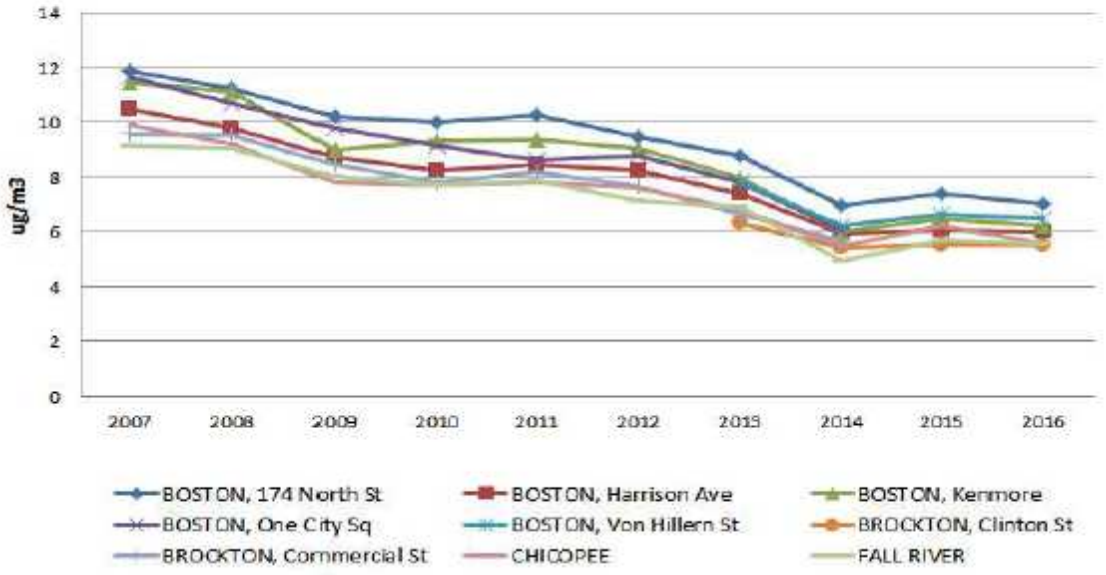
Ozone Exceedances 2007-2017 – from 2017 MassDEP air quality report (last 10 years) (current 8-hour standard is 0.070 ppm).

Figure 2
Ozone Exceedance Trends 2007-2016
Based on 0.070 ppm 8-Hour Standard



PM2.5 from 2017 MassDEP air quality report (current standard is 12 ug/m^3)

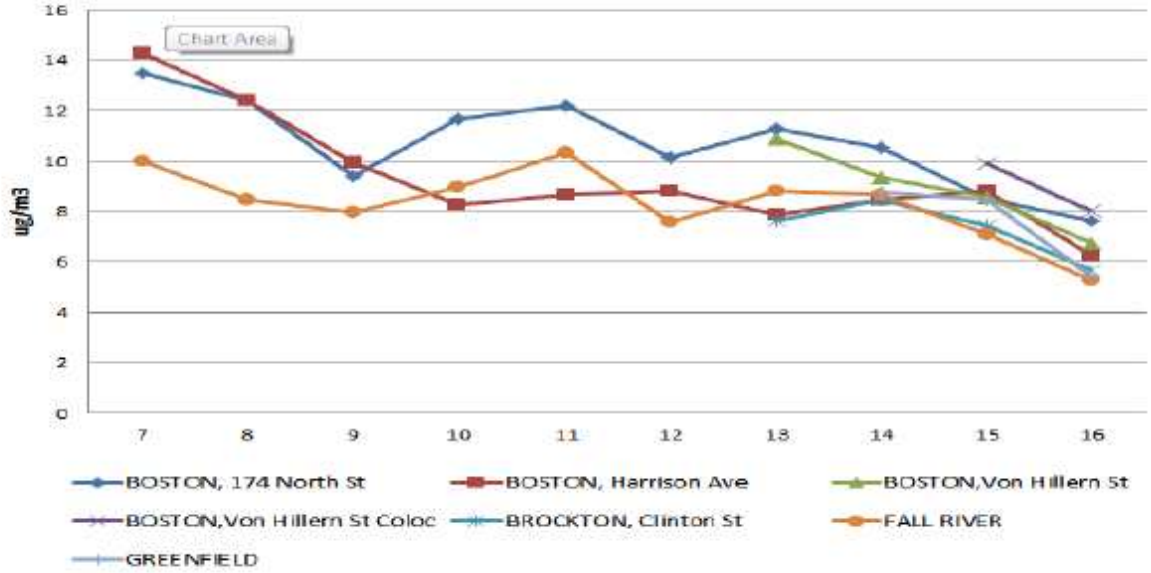
Figure 7
$PM_{2.5}$ Trends 2007-2016
FRM Annual Arithmetic Mean



$PM_{2.5}$ FEM Trends

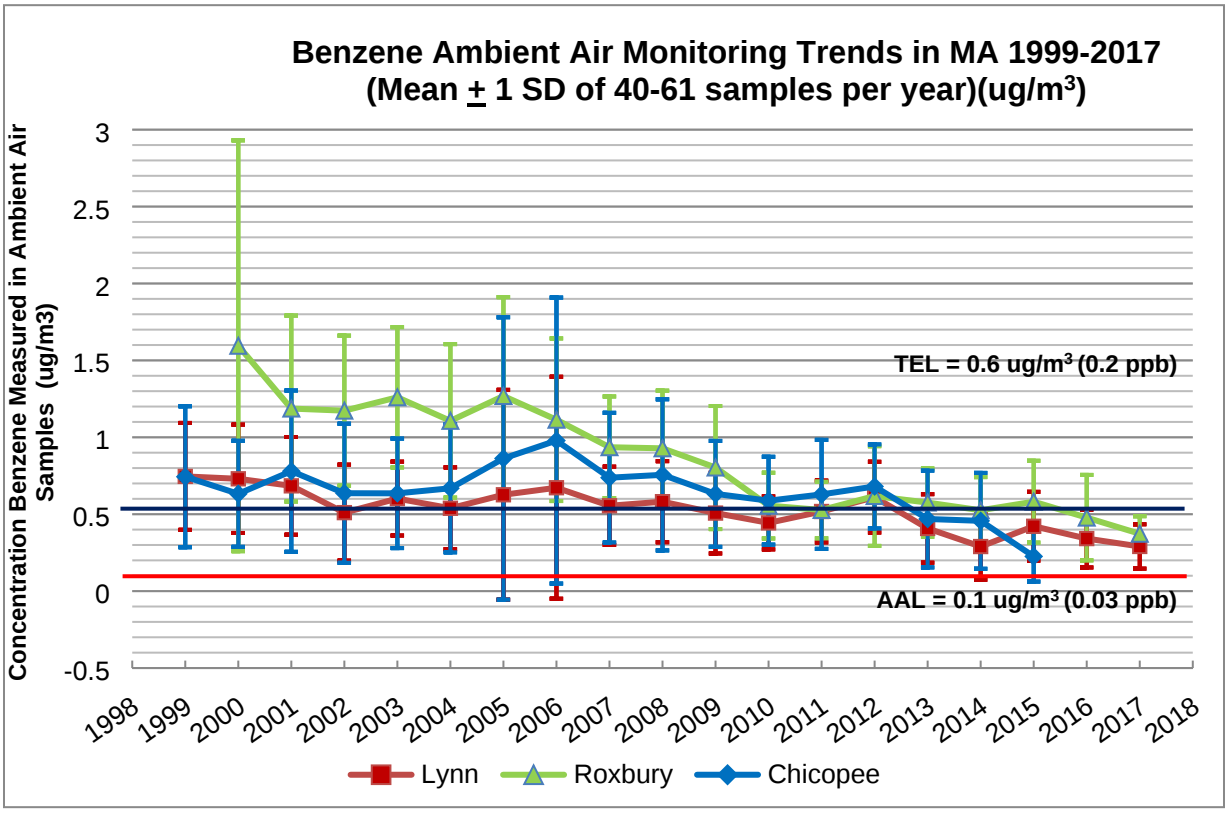
Figure 8 shows trends of the annual arithmetic mean for each $PM_{2.5}$ FEM site over the past 10 years. The current standard is 12 $\mu g/m^3$.

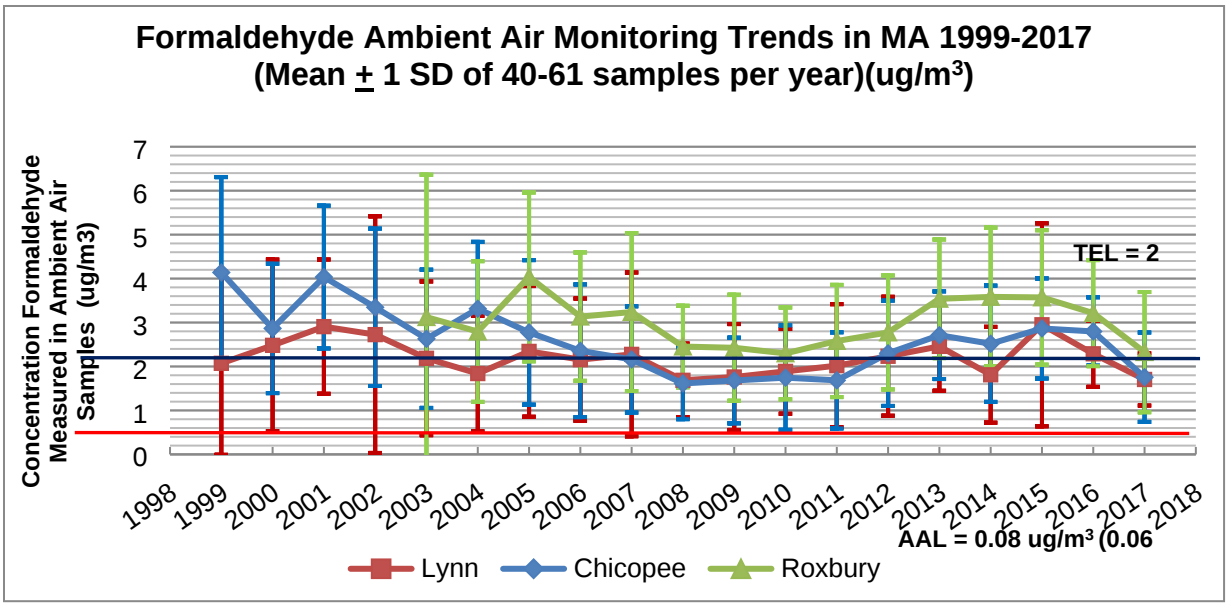
Figure 8
$PM_{2.5}$ Trends 2007-2016
FEM Annual Arithmetic Mean



Air Toxics

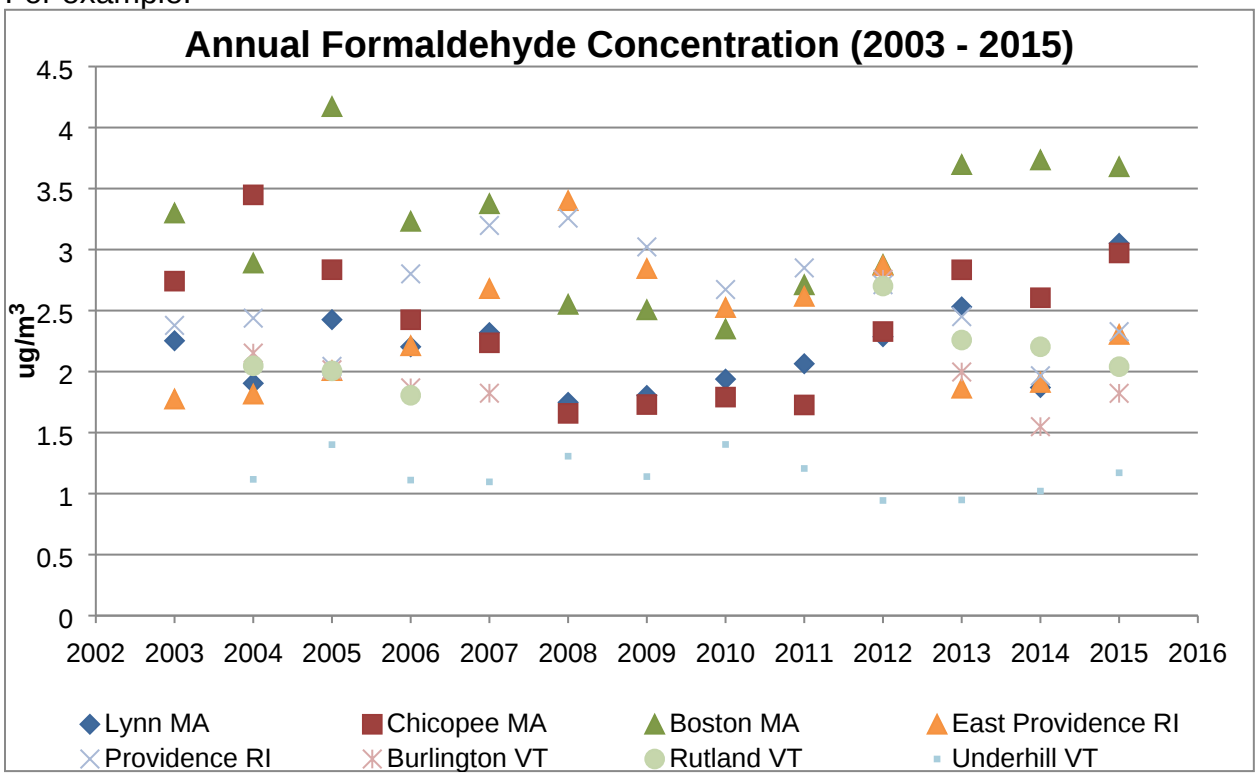
Available air monitoring data from Lynn, Roxbury and Chicopee (monitoring data QC'd through Dec. 2017) will be summarized using figures for benzene and formaldehyde. Figures for toluene, ethylbenzene, and total xylenes could be added, but I think we should just include them in a table with monitoring data. All air concentration data will be presented in units of ug/m^3.





Add comparison across New England states for benzene and formaldehyde to highlight that MA air concentrations are similar to other states.

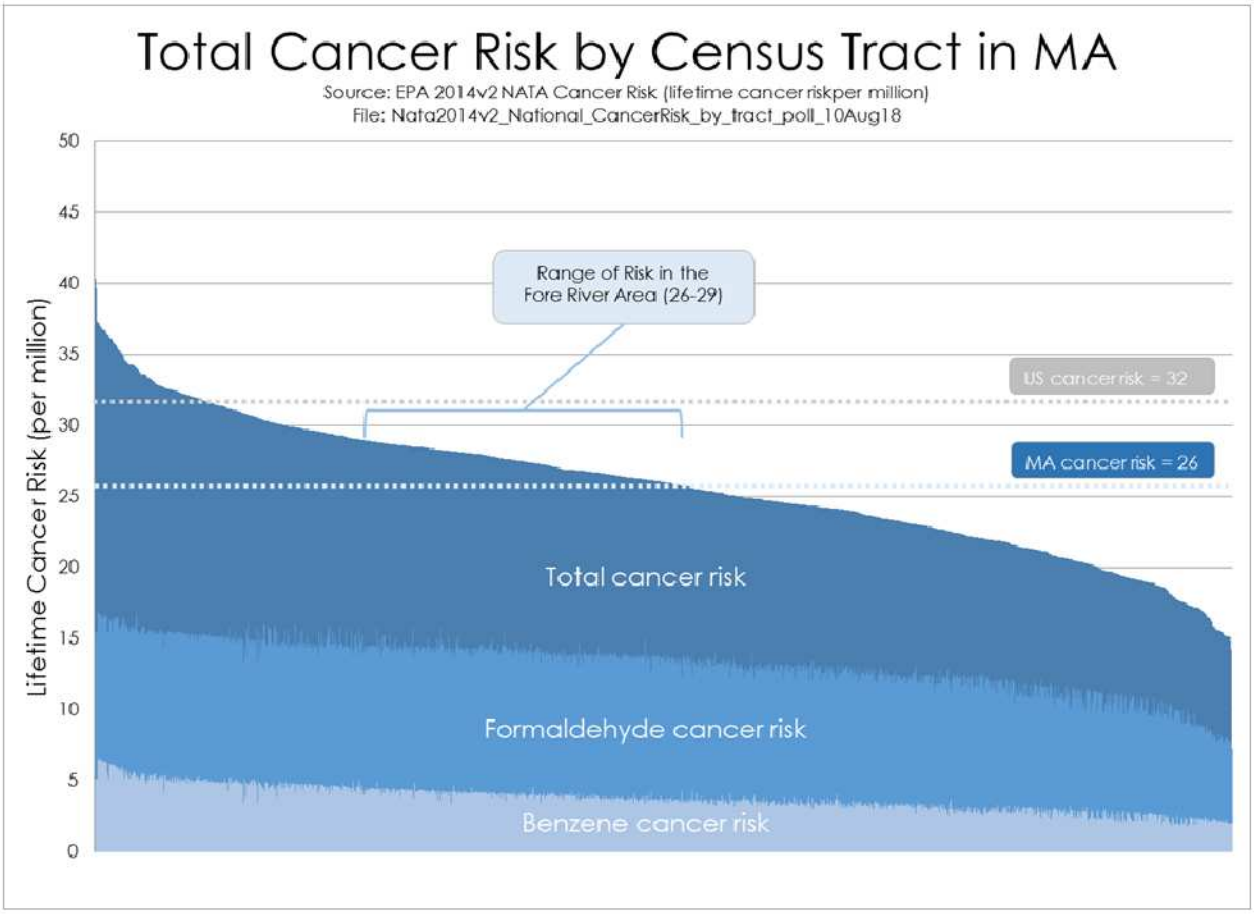
For example:



NATA data can be used to show state wide comparison– what do we want to use? Yes

- Total cancer risk –estimated by using exposure model and concentrations of air toxics,
- Non-cancer Hazard, or
- Concentration of air toxic, e.g., benzene, formaldehyde.

Total Cancer Risk 2014 NATA – The figure below shows total cancer risk by census tract contributed by a lifetime of exposure to air toxics. The contribution to total cancer risk from benzene and formaldehyde is shown for each census tract.



Could also (**or**) present as a table, for example:

NATA Cancer Risks and Benzene Concentrations - (not preferred)
These are the benzene values modeled for the 7 tracts within 2 km of the proposed Weymouth compressor site (see appendix for method used to identify tracts) and the excess lifetime cancer risks and respiratory HI calculated from the modeled benzene concentration. For comparison, the table includes total cancer risk from all sources and the respiratory hazard index (HI). *[Remember these risk calcs are done by EPA and so not have the same exposure assumptions as the AAL and TEL].*

Illustration only*

Tract	TOWN	Tract Population	Modeled Benzene Ambient Concentration (ug/m3)	Total Cancer Risk from Benzene (per million)	Total Cancer Risk (per million)	Respiratory Hazard Index
25021417802	Quincy	3150	0.8	6	35	1
25021417901	Quincy	6048	1.0	8	37	1
25021417902	Quincy	3542	1.0	7	37	2
25021419400	Braintree	3166	0.9	6	33	1
25021422600	Weymouth	6668	0.7	5	30	1
25021422700	Weymouth	3842	0.7	6	33	1
25021422800	Weymouth	3852	0.8	6	34	1
	State	Xxx	Xxx	X	35	x

*Note values in table are from NATA 2011. Values in NATA 2014 are lower, e.g., all HI are less than 1 for every tract in the state.

2. Assess current ambient concentrations of measured air pollutants in the study area and modeled air pollution concentrations from the proposed compressor station - MassDEP

A. Assess baseline air quality conditions using monitoring data collected by MassDEP in the study area

MassDEP will assess baseline air quality conditions by collecting monitoring data for 40 volatile organic compounds (VOC) including, benzene, toluene, ethylbenzene, xylene and formaldehyde[1] in the study area and comparing the results to statewide levels and MassDEP ambient air guidelines. MassDEP guidelines are health based guidelines that are designed to be protective of public health. MassDEP compares the NTEL[2] and the TEL[3] and designates the lower concentration as the AAL.[4]

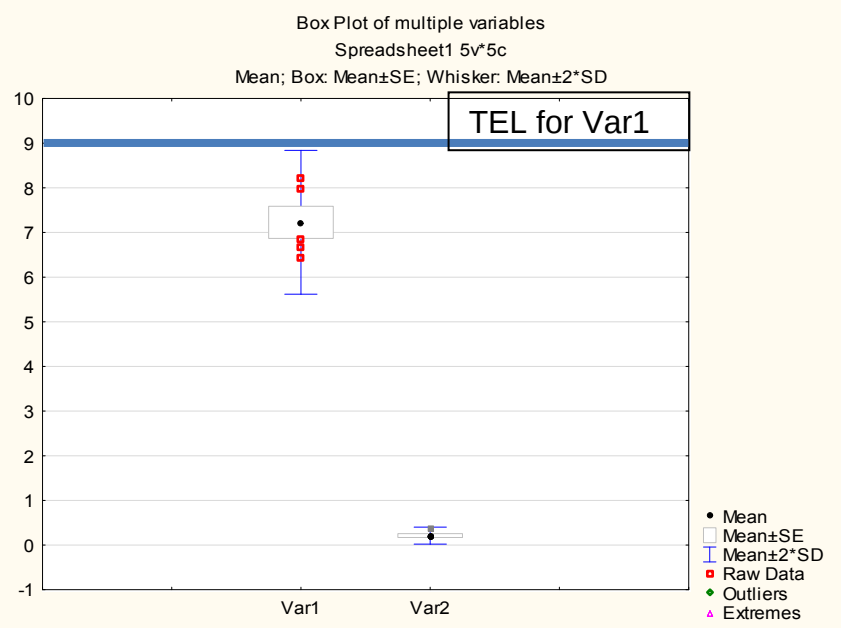
[1] VOCs are measured using EPA Method TO-15 by SIM. MassDEP contracted with Alpha Analytical Laboratory to prepare and transport canisters, analyze samples, provide QA/QC and documentation. BTEX continuous monitor measured by xxx and formaldehyde measured by xxx. List of analytes will be included in appendix.

[2] **Non-Threshold Effects Exposure Limits (NTELs)** based on known or suspected carcinogenic health effects. The NTEL is a concentration associated with a one in a million excess lifetime cancer risk over a lifetime of continuous exposure.

[3] **Threshold Effects Exposure Limits (TELs)** based on non-cancer health effects. The TEL is a concentration intended to protect the general population, including sensitive populations such as children, from adverse health effects over a lifetime of continuous exposure. TELs take into account the fact that people may be exposed to a chemical from other sources, including indoor air, food, soil and water. The TEL is compared to a 24 hour average concentration.

[Want to answer the question – are we already exposed to more air toxics than other communities in MA?]

Monitoring Data
Below is an example of a mock-up of a figure summarizing concentrations of each chemical, one box plot of each e.g. benzene, formaldehyde and other chemicals that were detected. (7days of monitoring at 5 monitoring locations) full data presented in Appendix. Summary figure in HIA report.



Compare monitored concentration to state-wide levels measured at the state monitors in Roxbury, Lynn and Chicopee. Results from samples at the state monitoring sites collected during the same time period as the samples for Fore River HIA will not be available before the HIA needs to be completed. Thus the results from the samples collected for the Fore River HIA will be compared to the concentrations of air toxics measured over the last 3 years during the same time period.

Compare monitored concentration to TEL (need to be cautious about comparing 24-hr samples to AAL which is compared to the annual average. Could compare in box plot above for several chemicals. Use a table for comparing all to TEL and AAL(?)

Show BTEX continuous monitor results to
1) illustrate variability in conc. by time of day, day of week.
2) compare to other Fore River samples?

---

[4] Since, in general, NTELs are lower than TELs, most AALs are based on the NTEL, or risk of excess cancer. For chemicals that do not pose cancer risks, the AAL is based on the TEL. The AAL is compared to an annual average concentration.

B. Assess modeled emission concentrations from the proposed compressor station

MassDEP will prepare contour maps of the air dispersion modeling for the proposed compressor station to identify locations most likely to be impacted by emissions of benzene, formaldehyde, and acrolein. In addition, MassDEP will compare the modeled emissions concentrations from the air dispersion modeling for the proposed compressor station to statewide levels of PM2.5, NO2, benzene, formaldehyde and MassDEP Ambient Air Guidelines. This will assess the incremental exposure from the proposed compressor station. The concentration may be the maximum concentration projected to be emitted or some other measures.

Want to answer the question – will the emissions from the facility harm me/my family?

NAAQS results

Air Toxics results
Show rate of decline of modeled concentrations from highest modeled conc.
What is concentration at first buildings off-site, at park, other key places in community?

Consider plotting the areas where the cancer risk contribution from the three largest 8contributors to cancer risk combined is greater than 1 in 1 million.
I.e.,
Sum of modeled cancer risk(benzene, formaldehyde, 1,3-butadiene) =
Modeled conc (benzene) + Modeled conc (formaldehyde) + Modeled conc (1,3-butadiene)
AAL (benzene) AAL (formaldehyde) AAL (1,3-butadiene)

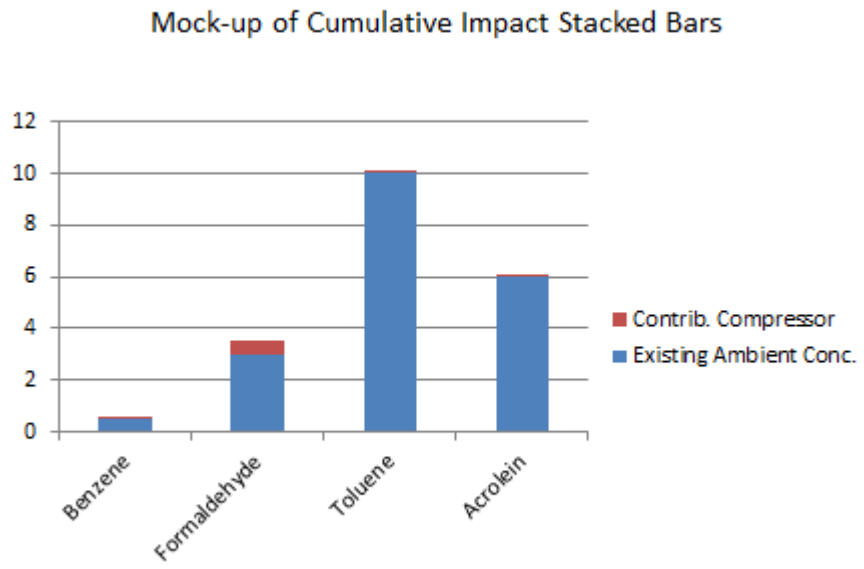
The AAL is the concentration where lifetime cancer risk from exposure to the chemical is 1 in 1 million.

C. Assess the cumulative impact from the modeled emission concentrations from the proposed compressor station in conjunction with baseline air quality conditions

MassDEP will assess the cumulative exposure from the proposed compressor station by comparing the modeled emissions concentrations from the air dispersion modeling plus existing background concentrations to statewide levels of PM2.5, NO2, benzene, formaldehyde and MassDEP Ambient Air Guidelines.

Want to answer the question – will the emissions from the facility harm me/my family since they will be added to the exposures we already receive.

Assess cumulative impact from modeled emission concentrations--- need to be clear that modeled conc. are the maximum conc. expected at the most impacted location.
Ambient concentration shown is, for example the annual average at the Roxbury monitor or highest 24-hr concentration measured during HIA monitoring period. Also be clear that TEL and AAL assume 70 years of exposure to that concentration.



If use a figure with multiple chemicals, could add bar for each chemical indicating the associated AAL or TEL.

OR Use a table
Cancer Risk (but also one for Hazard index?) VOCs detected during air monitoring

Chemical	Measure (max measured? Mean?, xth highest conc.?) of Fore River Ambient Concentration (ug/m3)	Measure of State Background (Roxbury/Lynn, whichever is most similar to FR) Ambient Concentration (ug/m3)	Modeled Emission Concentration (highest) (ug/m3)	Sum max (fore river, state monitors) existing and max modeled (ug/m3)	AAL (ug/m3)	Indicate if sum greater than AAL
Benzene						
Formaldehyde						
Toluene						
Xylene (total)						

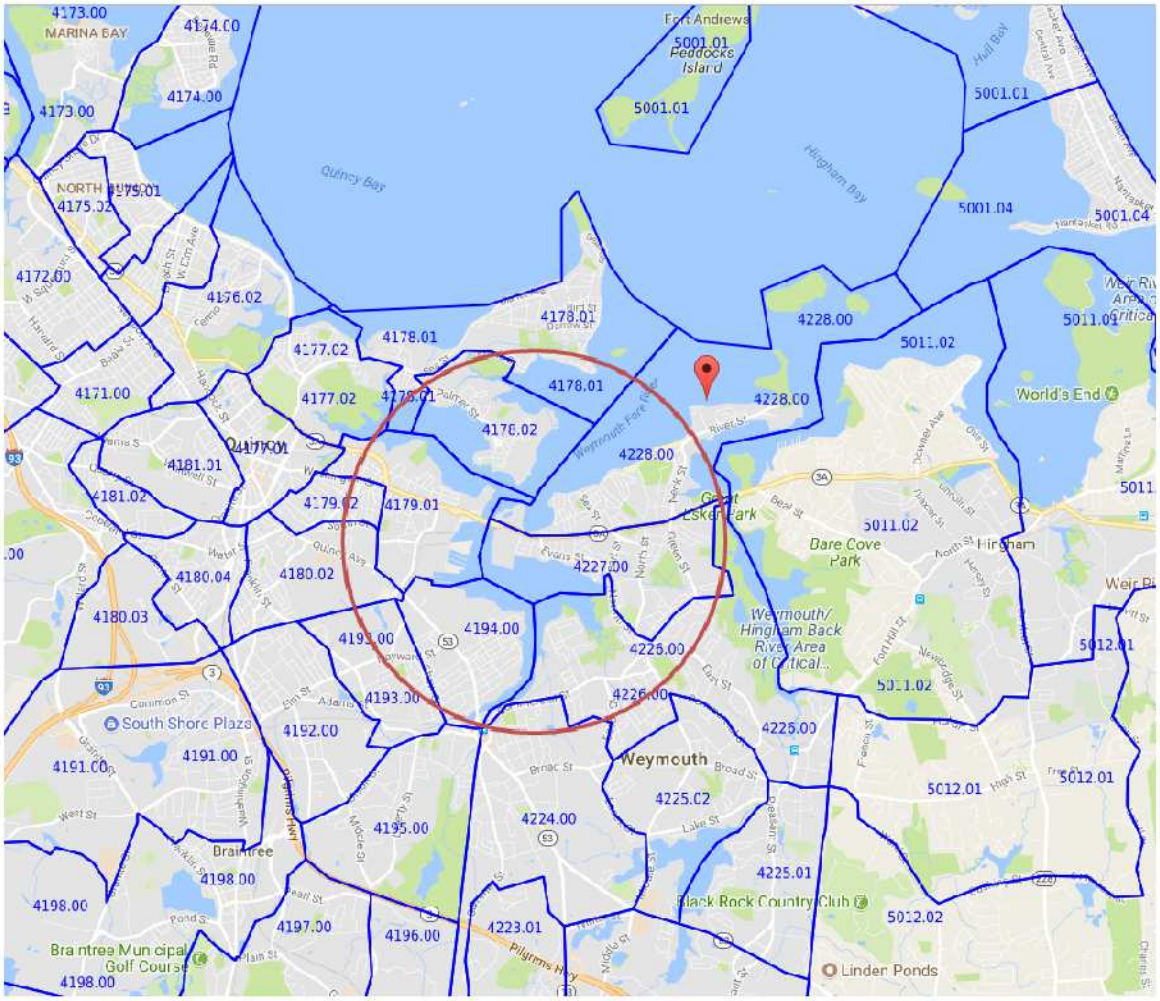
Others detected: acetone, ethylbenzene, styrene, naphthalene, chloroform, carbon tetrachloride, etc.					

Include in appendix

Weymouth Fore River Area Tracts

Below is map with 1 and 2 km radius circles around the proposed compressor site. Census tracts in the 2 km radius are listed in the table below.

Weymouth_Area TRACT-TOWN	
TRACT	**TOWN**
25021422800	weymouth
25021422700	weymouth
25021422600	weymouth
25021419400	braintree
25021417802	quincy
25021417901	quincy
25021417902	quincy


4173.00
MARINA BAY
4174.00
4173.00
4174.00
NORTH
4175.02
4172.00
4176.02
4171.00
4177.02
4178.01
4177.02
4178.01
4176.02
4228.00
4178.01
4228.00
4181.01
4181.02
4179.02
4179.01
4227.00
4180.04
4180.02
4180.03
4194.00
4193.00
4225.00
4226.00
4225.00
4192.00
4191.00
4191.00
Weymouth
4225.02
4224.00
4195.00
Braintree
4198.00
4225.01
4198.00
4197.00
4196.00
4223.01
4198.00
Fort Andrews
5001.01
Peddocks Island
5001.01
5001.01
5001.04
5001.04
5011.02
5011.02
5011.02
5012.01
5012.01
5012.01
5012.02
Quincy Bay
Hingham Bay
World's End
Great Esker Park
Dare Cove Park
Hingham
Weymouth/ Hingham Back River Area of Critical...
South Shore Plaza
Black Rock Country Club
Linder Ponds
Braintree Municipal Golf Course